

(19)



(11)

EP 2 861 927 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:

12.09.2018 Bulletin 2018/37

(51) Int Cl.:

F28F 3/04 ^(2006.01)

F28D 1/03 ^(2006.01)

(86) International application number:

PCT/IT2013/000173

(21) Application number: **13756698.0**

(22) Date of filing: **14.06.2013**

(87) International publication number:

WO 2013/186801 (19.12.2013 Gazette 2013/51)

(54) **RADIANT PLATE FOR A RADIATOR FOR HEATING A ROOM**

STRAHLUNGSPLATTE FÜR EINEN HEIZKÖRPER ZUM BEHEIZEN EINES RAUMES

PLAQUE RADIANTE PLATE POUR RADIATEUR POUR CHAUFFER UNE PIÈCE

(84) Designated Contracting States:

**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**

(30) Priority: **15.06.2012 IT MI20121038**

(43) Date of publication of application:

22.04.2015 Bulletin 2015/17

(73) Proprietor: **DL RADIATORS S.R.L.**

31100 Treviso (TV) (IT)

(72) Inventors:

• **ZANOLIN, Sergio**
I-33070 Polcenigo (Pordenone) (IT)

• **TOFFOLO, Raffaele**

I-31100 Treviso (IT)

(74) Representative: **Rapisardi, Mariacristina**

Ufficio Brevetti Rapisardi S.r.l.

Via Serbelloni, 12

20122 Milano (IT)

(56) References cited:

WO-A1-2004/005825 FR-A- 1 398 806

FR-A- 1 422 888 FR-A- 1 566 565

FR-A- 1 566 662 US-A- 2 957 679

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

[0001] The present invention relates to a radiant plate for a radiator for heating a room, and to a radiator that has such a radiant plate.

[0002] A type of radiant plate radiator that is either connected to a circuit or autonomous, wherein each radiant plate is formed by one or more sheet metal bodies composed of two half-shells reciprocally united along their perimeter and at lowered internal contact areas, is well known. The body is configured in such a way as to internally delimit a circuit for a heating fluid, comprising a first flat longitudinal manifold which extends along a first side of the perimeter of the half-shells, a second flat longitudinal manifold which extends along a second side of the perimeter of the half-shells opposite the first side, and a plurality of flat channels which transversally connect the manifolds and are separated by the lowered contact areas.

[0003] The radiator is designed to be able to withstand the operating pressure, test pressure and burst pressure in accordance with strict regulations.

[0004] The solution widely adopted today to impart the necessary structural strength to the radiant plates, especially at the manifolds, where the most critical points are located, envisages the use of sheet steel whose thickness is increased taking into account a specific safety factor. Consequently, the sheet steel presently used for the construction of radiant plates generally has a thickness in the range of 1.1 to 1.2 mm.

[0005] This solution, though ensuring the necessary mechanical strength, results in a high consumption of raw materials and heavy weight of the finished product. US2957679 and FR 1422888 disclose a radiant plate according to preamble of claim 1.

[0006] The technical task that the present invention sets itself is thus to realize a radiant plate for a radiator for heating a room which enables the aforementioned technical drawbacks of the prior art to be eliminated.

[0007] Within the scope of this technical task, one object of the invention is to realize a radiant plate which, though ensuring the necessary mechanical strength, achieves decided savings in raw materials and ultimately a reduction in the weight of the finished product.

[0008] Another object of the invention is to realize a robust, economical, lightweight radiant plate which assures optimized heat exchange efficiency.

[0009] The technical task, as well as these and other objects, according to the present invention, are achieved by realizing a plate for a radiant plate radiator for heating a room, formed by a sheet metal body composed of two half-shells reciprocally united along their perimeter and at lowered contact areas spaced from said perimeter, said body being configured in such a way as to internally delimit a circuit for a heating fluid, comprising a first longitudinal manifold which extends along a first side of the perimeter of the half-shells, a second longitudinal manifold which extends along a second side of the perimeter

of the half-shells opposite the first side, and a plurality of flat channels which transversally connect said first and second manifold and are separated by said lowered contact areas, wherein at least one of the manifolds has mechanical stiffening means for increasing its resistance to the pressure of the heating fluid, wherein the body mainly lies in a plane, wherein the dimension of at least one manifold in the direction orthogonal to the plane in which the body mainly lies is greater than or equal to that of the flat channels, said stiffening means comprise one or more ribs of the metal sheet configured as areas projecting toward the outside of the manifold. According to one particularly advantageous aspect of the invention, the necessary mechanical strength is imparted to the plate not by increasing the thickness of the sheet of the body it is formed from, but rather by appropriately shaping the sheet with the aim of reinforcing the weaker areas more exposed to the hydraulic pressure of the heating fluid.

[0010] Other features of the present invention are moreover defined in the dependent claims.

[0011] Additional features and advantages of the invention will be more apparent from the description of a preferred but non-exclusive embodiment of the radiant plate and of the radiant plate radiator according to the invention, illustrated by way of non-restrictive example in the appended drawings, in which:

figure 1 shows an axonometric view of a radiant plate for a radiator;

figure 2 shows the radiant plate of figure 1 viewed frontally;

figure 3 shows the radiant plate cut away along the line B-B of figure 2;

figure 4 shows the radiant plate cut away along the line C-C of figure 2;

figure 5 shows the radiant plate cut away along the line A-A of figure 2 and provided with a first type of plumbing connection;

and figure 6 shows the radiant plate cut away along the line A-A of figure 2 and provided with a traditional type of plumbing connection.

[0012] With reference to the aforementioned figures, there is shown a radiant plate 1 for a radiator for heating a room.

[0013] The radiator can comprise one or more radiant plates 1 connected in cascade and is generally installed so that it mainly lies in a vertical plane.

[0014] Each radiant plate 1 is formed by a sheet metal body, generally of steel, composed of two half-shells 2 reciprocally united, by welding, along their perimeter and at lowered contact areas 3 spaced from their perimeter.

[0015] The body has a much smaller dimension in the direction Z (indicated by an arrow in figure 3), orthogonal to the plane L in which it mainly lies, than in the two directions X, Y (indicated by arrows in figure 2), which are orthogonal to each other and parallel to the plane L in which it mainly lies L (indicated by dot-dash line in figure

4).

[0016] The body is configured in such a way as to internally delimit a circuit for a heating fluid, comprising a first longitudinal manifold 4, which extends along a first side 5 of the perimeter of the half-shells 2, a second longitudinal manifold 6, which extends along a second side 7 of the perimeter of the half-shells 2 opposite to the first side 5, and a plurality of flat channels 8 which transversally connect the first manifold 4 to the second manifold 6 and are separated by means of the lowered contact areas 3.

[0017] More precisely, each manifold 4, 6 extends along a straight longitudinal axis, whereas the flat channels 8, as well as the areas 3, are parallel to one another and equally spaced and extend along a straight longitudinal axis which is orthogonal to that of the manifolds 4, 6.

[0018] In particular, each flat channel 8 has a substantially rounded hexagonal cross section, being delimited by two opposite flat walls 9 parallel to the plane L in which the body mainly lies and by four inclined walls 10, whereas each lowered contact area 3 is defined between two mutually opposite flat walls 11 in contact and parallel to the plane L in which the body mainly lies.

[0019] Advantageously, at least one of the manifolds 4, 6, and preferably both of the manifolds 4, 6, have mechanical stiffening means for increasing the resistance to the pressure of the heating fluid.

[0020] The reinforcement means preferably comprise one or more reinforcement ribs 12 obtained by suitably shaping the metal sheet of the half-shells 2 in the area that forms the manifolds 4, 6.

[0021] The half-shells 2 are configured in such a way that at least one manifold 4, 6 and preferably both manifolds 4, 6 have a dimension in the direction Z, orthogonal to the plane L in which the body mainly lies, that is greater than or equal to that of the flat channels 8.

[0022] In particular, each manifold 4, 6 has a large rounded cross section for at least most of its longitudinal extent.

[0023] The ribs 12 are preferably configured as areas 13 of the sheet which project toward the outside of the manifolds 4, 6.

[0024] In this manner, the ribs 12 contribute on one hand to increasing the passage section for the heating fluid supplied by manifolds 4, 6, and on the other hand create in the manifolds 4, 6 recesses which favour the creation of greater turbulence in the flow of heating fluid, as exemplified by the arrows in figures 5 and 6, which illustrate the path of the heating fluid, with a consequent improvement in the overall heat exchange efficiency.

[0025] Each area 13 extends along the axial extension of a flat channel 8, and preferably extends for the whole transversal extent of the manifold 4, 6.

[0026] Therefore, the manifold 4, 6 comprises, in an axial direction, a sequence of areas 13 that are in greater relief due to the presence of the ribs 12, alternating with areas that are in lesser relief 21, where no ribs 12 are present, but which nonetheless have a dimension in di-

rection Z that is preferably is greater than or equal to that of the flat channels 8.

[0027] Along the transversal direction of each manifold 4, 6, the areas 13 have a variable distance in direction Z from the areas 21, and in particular this distance is progressively reduced proceeding from the end of the flat channel 8 to the perimetrical side of the half-shells 2.

[0028] In the area where a hole 15 is provided for the plumbing connector 16, the manifold 4, 6 can advantageously be flattened to facilitate the connection with the connector 16 itself.

[0029] The plumbing connector in figure 5, specially designed for the new plate, comprises a bushing 17 having a flat end fixed against the inner side of the flattened area of the manifold 4, 6. The part of the bushing 17 that is external to the plate is introduced at a right angle into a coupling 19 and is provided with radial holes 18 for the passage of the heating fluid from the coupling 19 to the manifold 4, 6.

[0030] The plumbing connector 16 shown in figure 6 is instead of a traditional type and is mounted with the aid of a ring 20 fixed inside the manifold 4, 6. Advantageously, therefore, it is possible to apply a traditional plumbing connection to the new plate without the need to change the already existing equipment and assembly lines.

[0031] Thanks to the stiffening means provided, a sheet of reduced thickness can be used for the half-shells 2, in particular a sheet steel of a thickness ranging between 0.7 mm and 0.9 mm, with obvious positive repercussions in terms of savings of raw materials and reduction in the weight of the finished product.

[0032] It has been found that in this range of sheet thickness the heat exchange efficiency remains practically unchanged compared to that obtainable with the thicknesses traditionally adopted.

[0033] The radiator that is realizable with such a radiant plate can be connected to a circuit or be autonomous and the heating fluid is preferably water, a water and glycol mixture, or diathermic oil.

[0034] The radiant plate thus conceived is susceptible of numerous modifications and variants, all falling within the scope of the inventive concept; moreover, all the details may be replaced with other technically equivalent ones.

[0035] In practice, all of the materials used, as well as the dimensions, can be any whatsoever according to need and the state of the art.

Claims

1. A plate (1) for a radiant plate radiator for heating a room, formed by a sheet metal body composed of two half-shells (2) reciprocally united along the perimeter thereof and at lowered contact areas (3) spaced from said perimeter thereof, said body delimiting a circuit for a heating fluid, comprising a first

longitudinal manifold (4) which extends along a first side (5) of the perimeter of the half-shells (2), a second longitudinal manifold (6) which extends along a second side (7) of the perimeter of the half-shells (2) opposite the first side (5), and a plurality of flat channels (8) which transversally connect said first and second manifold (4, 6) and are separated by said lowered contact areas (3), wherein at least one of the manifolds (4, 6) has mechanical stiffening means for increasing the resistance thereof to the pressure of the heating fluid, **characterized in that** the body mainly lies in a plane (L), **in that** the dimension of at least one manifold (4, 6) in the direction orthogonal to the plane (L) in which the body mainly lies is greater than or equal to that of the flat channels (8), said stiffening means comprising one or more ribs of the metal sheet (12) configured as areas (13) projecting toward the outside of the manifold.

2. The plate (1) for a radiant plate radiator for heating a room according to any preceding claim, **characterized in that** at least one manifold (4, 6) has a rounded cross section at least along a main longitudinal portion thereof.
3. The plate (1) for a radiant plate radiator for heating a room according to any preceding claim, **characterized in that** at least one manifold (4, 6) has a flattened area provided with a hole (15) for inserting a plumbing connector (16).
4. The plate (1) for a radiant plate radiator for heating a room according to any preceding claim, **characterized in that** at least one projecting area (13) extends along the extension of a flat channel (8).
5. The plate (1) for a radiant plate radiator for heating a room according to any preceding claim, **characterized in that** at least one projecting area (13) extends for the entire transversal extent of the manifold (4, 6).
6. The plate (1) for a radiant plate radiator for heating a room according to any preceding claim, **characterized in that** said manifold (4, 6) comprises, in an axial direction, a sequence of projecting areas (13) that are in greater relief due to the presence of the ribs (12), alternating with areas that are in lesser relief (21), where no ribs (12) are present, but which have a dimension in the direction orthogonal to the plane (L) in which the body mainly lies that is greater than or equal to that of the flat channels (8).
7. The plate (1) for a radiant plate radiator for heating a room according to the preceding claim, **characterized in that** along the transversal direction of the manifold (4, 6) the projecting areas (13) have a variable distance from the areas in lesser relief (21) in

the direction orthogonal to the plane (L) in which the body mainly lies.

8. The plate (1) for a radiant plate radiator for heating a room according to the preceding claim, **characterized in that** said distance progressively decreases proceeding from the end of the flat channel (8) to the perimetrical side of the half-shells (2).
9. The plate (1) for a radiant plate radiator for heating a room according to the preceding claim, **characterized in that** said sheet metal is steel and has a thickness ranging between 0.7 mm and 0.9 mm.
10. A radiator for heating a room, **characterized in that** it comprises at least one radiant plate in accordance with any preceding claim.

20 Patentansprüche

1. Platte (1) für einen Strahlungsplattenheizkörper zum Beheizen eines Raums, geformt aus einem Blechmetallkörper, bestehend aus zwei Halbschalen (2), gegenseitig vereint entlang deren Umfangs und an herabgesetzten Kontaktbereichen (3), die von deren Umfang beabstandet sind, wobei der Körper einen Kreislauf für ein Heizmedium abgrenzt, umfassend ein erstes Längsverteilerrohr (4), das sich entlang einer ersten Seite (5) des Umfangs der Halbschalen (2) erstreckt, ein zweites Längsverteilerrohr (6), das sich entlang einer zweiten Seite (7) des Umfangs der Halbschalen (2) erstreckt, die der ersten Seite (5) entgegengesetzt angeordnet ist, um eine Vielzahl an flachen Kanälen (8), die quer das erste und das zweite Verteilerrohr (4, 6) verbunden und durch die herabgesetzten Kontaktbereiche (3) getrennt sind, wobei mindestens eins der Verteilerrohre (4, 6) mechanische Versteifungsmittel aufweist, um dessen Widerstand auf den Druck des Heizmediums zu erhöhen, **dadurch gekennzeichnet, dass** der Körper hauptsächlich in einer Ebene (L) liegt, dass die Abmessungen des mindestens einen Verteilerrohrs (4, 6) in der Richtung, die rechtwinklig zur Ebene (L) angeordnet ist, in der der Körper hauptsächlich liegt, größer oder gleich denen der flachen Kanäle (8) ist, wobei die Versteifungsmittel eine oder mehrere Rippen aus Metallblech (12) umfassen, ausgelegt als Bereiche (13), die hinführend zur Außenseite des Verteilerrohrs hervorragen.
2. Platte (1) für einen Strahlungsplattenheizkörper zum Beheizen eines Raums nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** mindestens ein Verteilerrohr (4, 6) einen abgerundeten Querschnitt zumindest entlang eines Hauptlängsabschnitts davon aufweist.

3. Platte (1) für einen Strahlungsplattenheizkörper zum Beheizen eines Raums nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** mindestens ein Verteilerrohr (4, 6) einen abgeflachten Bereich aufweist, der mit einem Loch (15) zum Einfügen eines Rohrleitungsverbinders (16) versehen ist. 5
4. Platte (1) für einen Strahlungsplattenheizkörper zum Beheizen eines Raums nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** sich mindestens ein hervorspringender Bereich (13) entlang der Ausdehnung eines flachen Kanals (8) erstreckt. 10
5. Platte (1) für einen Strahlungsplattenheizkörper zum Beheizen eines Raums nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** sich mindestens ein hervorspringender Bereich (13) auf der gesamten Querausdehnung des Verteilerrohrs (4, 6) erstreckt. 15
6. Platte (1) für einen Strahlungsplattenheizkörper zum Beheizen eines Raums nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Verteilerrohr (4, 6) in einer axialen Richtung eine Abfolge von hervorspringenden Bereichen (13) umfasst, die stärker hervorstehen, da die Rippen (12) bereitgestellt sind, und die sich mit Bereichen, die weniger hervorstehen (21), an denen keine Rippen (12) bereitgestellt sind, abwechseln, die jedoch eine Größe in der Richtung, die rechtwinklig zur Ebene (L) angeordnet ist, in der der Körper hauptsächlich liegt, aufweisen, die größer oder gleich der der flachen Kanäle (8) ist. 20
7. Platte (1) für einen Strahlungsplattenheizkörper zum Beheizen eines Raums nach dem vorhergehenden Anspruch, **dadurch gekennzeichnet, dass** die hervorspringenden Bereiche (13) entlang der Querrichtung des Verteilerrohrs (4, 6) einen variablen Abstand von den Bereichen, die weniger hervorstehen (21), in der Richtung, die rechtwinklig zur Ebene (L) angeordnet ist, in der der Körper hauptsächlich liegt, aufweisen. 25
8. Platte (1) für einen Strahlungsplattenheizkörper zum Beheizen eines Raums nach dem vorhergehenden Anspruch, **dadurch gekennzeichnet, dass** der Abstand ausgehend vom Ende des flachen Kanals (8) bis zur umfangsseitigen Seite der Halbschalen (2) progressiv abnimmt. 30
9. Platte (1) für einen Strahlungsplattenheizkörper zum Beheizen eines Raums nach dem vorhergehenden Anspruch, **dadurch gekennzeichnet, dass** das Blechmetall Stahl ist und eine Dicke zwischen 0,7 mm und 0,9 mm aufweist. 35

10. Heizkörper zum Beheizen eines Raums, **dadurch gekennzeichnet, dass** er mindestens eine Strahlungsplatte nach einem der vorhergehenden Ansprüche umfasst. 40

Revendications

1. Plaque (1) pour un radiateur à plaque radiante pour chauffer une pièce, formée par un corps en tôle composé de deux demi-coques (2) réciproquement unies le long de son périmètre et en correspondance de zones de contact abaissées (3) espacées dudit périmètre, ledit corps délimitant un circuit pour un fluide chauffant, comprenant un premier collecteur longitudinal (4) qui se prolonge le long d'un premier côté (5) du périmètre des demi-coques (2), un second collecteur longitudinal (6) se prolongeant le long d'un second côté (7) du périmètre des demi-coques (2) opposé au premier côté (5), et une pluralité de canaux plats (8) qui relient transversalement lesdits premier et second collecteurs (4, 6) et étant séparés par lesdites zones de contact abaissées (3), dans laquelle au moins un des collecteurs (4, 6) comporte des moyens de raidissement mécaniques pour augmenter sa résistance à la pression du fluide chauffant, **caractérisée en ce que** le corps repose principalement dans un plan (L), **en ce que** la dimension de l'au moins un collecteur (4, 6), dans la direction orthogonale au plan (L) dans lequel le corps repose principalement, est supérieure ou égale à celle des canaux plats (8), lesdits moyens de raidissement comprenant une ou plusieurs nervures de la feuille de métal (12) configurées comme des zones (13) dépassant vers l'extérieur du collecteur. 45
2. Plaque (1) pour un radiateur à plaque radiante pour chauffer une pièce selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'au moins un collecteur (4, 6) comporte une section transversale arrondie au moins le long de sa partie longitudinale principale.** 50
3. Plaque (1) pour un radiateur à plaque radiante pour chauffer une pièce selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'au moins un collecteur (4, 6) comporte une zone aplatie pourvue d'un orifice (15) pour introduire un raccord de plomberie (16).** 55
4. Plaque (1) pour un radiateur à plaque radiante pour chauffer une pièce selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'au moins une zone en saillie (13) se prolonge le long de l'extension d'un canal plat (8).**
5. Plaque (1) pour un radiateur à plaque radiante pour chauffer une pièce selon l'une quelconque des re-

vendications précédentes, **caractérisée en ce qu'**au moins une zone en saillie (13) se prolonge sur toute l'extension transversale du collecteur (4, 6).

6. Plaque (1) pour un radiateur à plaque radiante pour chauffer une pièce selon l'une quelconque des revendications précédentes, **caractérisée en ce que** ledit collecteur (4, 6) comprend, dans une direction axiale, une séquence de zones en saillie (13) étant plus en relief en raison de la présence des nervures (12), s'alternant avec des zones étant moins en relief (21) où il n'y a pas de nervures (12) mais qui comportent une dimension, dans la direction orthogonale au plan (L) dans laquelle le corps repose principalement, étant supérieure ou égale à celle des canaux plats (8). 5
10
15

7. Plaque (1) pour un radiateur à plaque radiante pour chauffer une pièce selon la revendication précédente, **caractérisée en ce que** le long de la direction transversale du collecteur (4, 6), les zones en saillie (13) possèdent une distance variable à partir des zones étant moins en relief (21) dans la direction orthogonale au plan (L) dans lequel le corps repose principalement. 20
25

8. Plaque (1) pour un radiateur à plaque radiante pour chauffer une pièce selon la revendication précédente, **caractérisée en ce que** ladite distance diminue progressivement en partant de l'extrémité du canal plat (8) vers le côté périphérique des demi-coques (2). 30

9. Plaque (1) pour un radiateur à plaque radiante pour chauffer une pièce selon la revendication précédente, **caractérisée en ce que** ladite tôle est en acier et a une épaisseur comprise entre 0,7 et 0,9 mm. 35

10. Radiateur pour chauffer une pièce, **caractérisé en ce qu'**il comprend au moins une plaque radiante selon l'une quelconque des revendications précédentes. 40

45

50

55

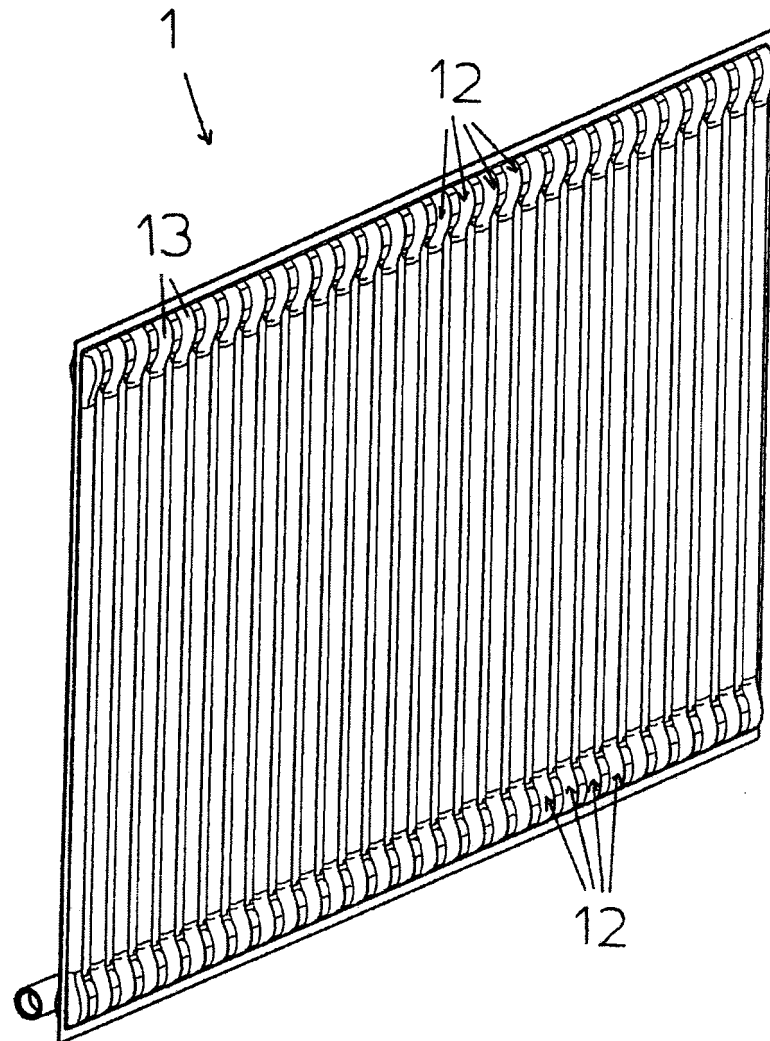
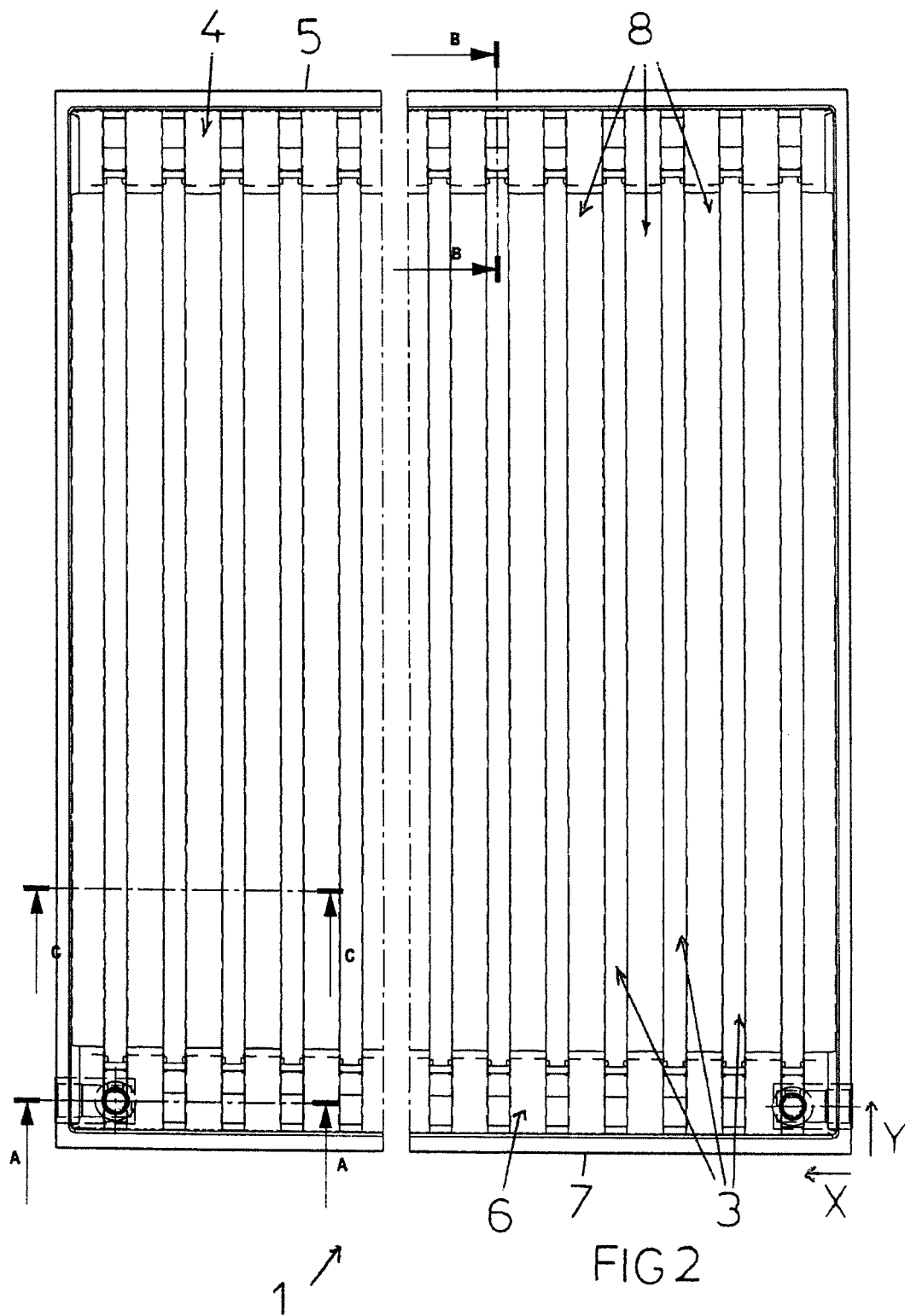
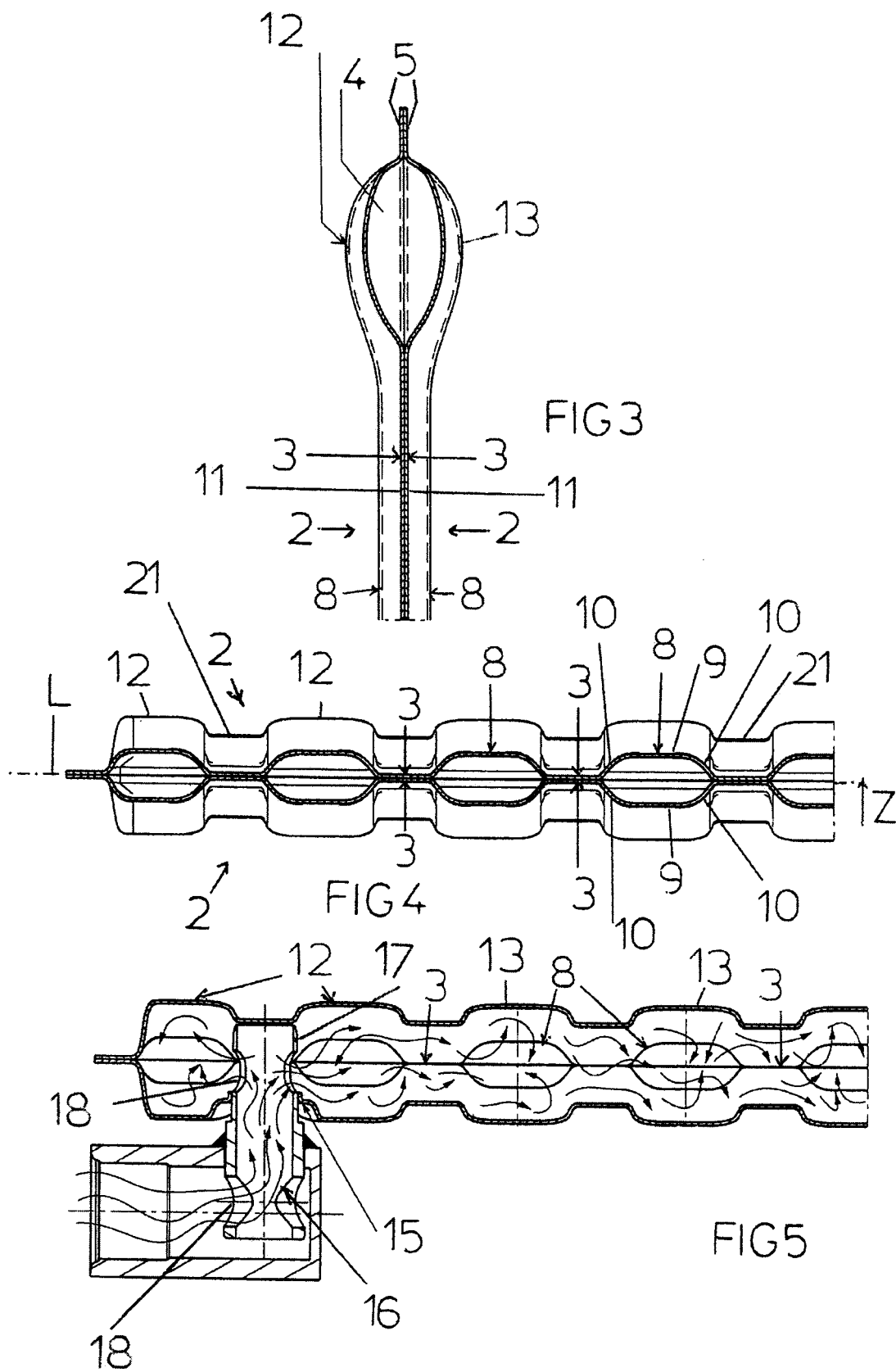
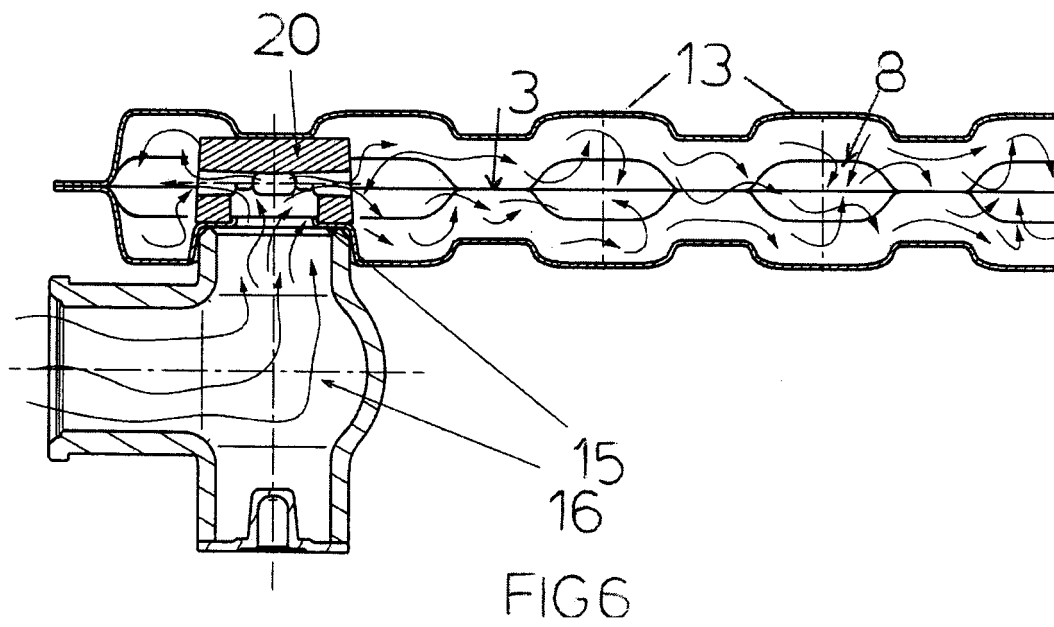


FIG1







REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 2957679 A [0005]
- FR 1422888 [0005]